Mood as illocutionary centering

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Abstract

By this point, we have developed articulated analyses of top-level temporal anaphora, including temporal quantification, in languages with grammatical tense and/or aspect systems, represented by English, Polish, and Mandarin. But it is still not clear how this approach might extend to temporal anaphora in a language such as Kalaallisut, which has neither grammatical tense nor grammatical aspect, but instead marks only grammatical mood and person. Most theories of mood and modal reference either ignore temporal reference entirely (e.g. Hamblin 1973, Stalnaker 1975, Karttunen 1977, Kratzer 1981, Groenendijk and Stokhof 1984, Roberts 1987, Farkas 1992, Portner 2004, a.m.o.) or analyze modal and temporal reference as independent phenomena (e.g. Muskens 1995, Stone 1997, Mastop 2005). Such theories provide no inkling how temporal reference in a tenseless mood-based language can be as precise as in English (see e.g. Bittner 2005, 2007, 2009, 2011).

More promising is the performative approach, which relates modal and temporal reference in a way that might shed light on this puzzle (Stenius 1967, etc). For example, Lewis (1972) proposes "to analyze all sentences, declarative and non-declarative, into two components: a *sentence radical* that specifies a state of affairs, and a *mood* that determines whether the speaker is declaring that the state of affairs holds, commanding that it hold, asking whether it holds, or what."

Lewis's own implementation is problematic. For example, it wrongly predicts that all sentences, including non-declaratives, have truth values. It also fails to extend to embedded moods. In Kalaallisut, however, this failure is, in fact, a plus, because illocutionary moods do not embed. Moreover, recent theories of *at-issue* and *not-at-issue* assertions (see AnderBois *et al.* 2010, Murray 2010) make it possible to distinguish declaratives, which make at-issue assertions and therefore have truth values, from non-declaratives, which do not. Building on these recent advances, I propose a new performative theory of illocutionary mood that avoids the problems of Lewis's (1972) implementation and extends the proposed *TAMP* universals to grammatical mood.

Outline

1. Declaratives with(out) reportative recentering
2. Optatives with(out) reportative recentering
3. Kalaallisut verbal inflections as top-level anaphora
4. Why only declaratives have truth conditions

1 DECLARATIVES WITH(OUT) REPORTATIVE RECENTERING

(1) *Ole ani-sima-**pu**-q (#uanga=li tamanna upiri-nngit-**la**-ra).*
Ole go.out-prf-*DEC*$_{\top}$-3SG (1SG=but that believe-not-*DEC*-1SG.3SG)
Ole has gone out (#, but I don't believe it).

(2) *Ole=**guuq** ani-sima-**pu**-q (uanga=li tamanna upiri-nngit-**la**-ra).*
Ole=*RPT* go.out-prf-*DEC*$_{\top}$-3SG (1SG=but that believe-not-*DEC*-1SG.3SG)
Ole has gone out, I'm told (, but I don't believe it).

(3) $^{st}e_a := \{\langle\langle w_a, p_a, e_a\rangle, \langle\rangle\rangle \mid w_a \in p_a \subseteq \{v \mid \langle e_a, \uparrow e_a, \downarrow e_a\rangle \in [\![\underline{spk.to}]\!](v)\}\}$

(4)

$\langle\langle w_0, p_{012}, e_a\rangle, \langle\rangle\rangle$	Notation:	*minimal info-state*
$\langle\langle w_1, p_{012}, e_a\rangle, \langle\rangle\rangle$	$p_{012} = \{w_0, w_1, w_2\}$	
$\langle\langle w_2, p_{012}, e_a\rangle, \langle\rangle\rangle$	$p_{nm} = \{w_n, w_m\}$	
$\langle\langle w_0, p_{01}, e_a\rangle, \langle\rangle\rangle$	$p_n = \{w_n\}$	
$\langle\langle w_1, p_{01}, e_a\rangle, \langle\rangle\rangle$		
$\langle\langle w_0, p_{02}, e_a\rangle, \langle\rangle\rangle$		
$\langle\langle w_2, p_{02}, e_a\rangle, \langle\rangle\rangle$		
$\langle\langle w_1, p_{12}, e_a\rangle, \langle\rangle\rangle$		
$\langle\langle w_2, p_{12}, e_a\rangle, \langle\rangle\rangle$		
$\langle\langle w_0, p_0, e_a\rangle, \langle\rangle\rangle$		
$\langle\langle w_1, p_1, e_a\rangle, \langle\rangle\rangle$		
$\langle\langle w_2, p_2, e_a\rangle, \langle\rangle\rangle$		

(1′) Ole [$_{DEC}$ go.out-prf-]-DEC$_{\top}$-3SG
$^{\top}[x \mid x =_i ole]; (\partial[\underline{spk.to}_{\top\Omega}\langle\top\varepsilon, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle]; [go.out_{\top\omega}\langle\top\delta\rangle]; {}^{\top}[p \mid p =_I \top\omega\|_{\top\Omega}])$

(1″) $\{\langle\langle p'_a, \mathbf{o}, w_a, p_a, e_a\rangle, \langle\rangle\rangle \mid \mathbf{o} = [\![ole]\!]$
$\& \; p_a \subseteq \{v \mid \langle e_a, \uparrow e_a, \downarrow e_a\rangle \in [\![\underline{spk.to}]\!](v)\}$
$\& \; w_a \in p'_a = \{v \in p_a \mid \mathbf{o} \in [\![gone.out]\!](v)\}\}$

($^{<}$) $e' = {}^{<}e \;\Rightarrow\; e, e' \in \mathcal{D}_{\varepsilon} \;\&\; \uparrow e' \neq \uparrow e$ ($^{<}$e, *source* of e)

(2′) Ole=*RPT*
$^{\top}[x \mid x =_i ole]; \partial[\underline{spk.to}_{\top\Omega}\langle\top\varepsilon, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle]; {}^{\top}[p \mid \underline{spk.to}_p\langle{}^{<}\top\varepsilon, \uparrow{}^{<}\top\varepsilon, \downarrow{}^{<}\top\varepsilon\rangle];$
$^{\top}[w \mid w \in_i \top\Omega]\ {}^{\top}; \ldots$
[[$_{DEC}$ go.out-prf-]-*DEC*$_{\top}$-3SG]
$\partial[\underline{spk.to}_{\top\Omega}\langle{}^{<}\top\varepsilon, \uparrow{}^{<}\top\varepsilon, \downarrow{}^{<}\top\varepsilon\rangle]; [gone.out_{\top\omega}\langle\top\delta\rangle]; {}^{\top}[p \mid p =_I \top\omega\|_{\top\Omega}]$

(2″) $\{\langle\langle p'_{<b}, w_{<b}, p_{<b}, \mathbf{o}, w_b, p_b, e_b\rangle, \langle\rangle\rangle \mid \mathbf{o} = [\![ole]\!]$
$\& \; w_b \in p_b \subseteq \{v \in p_{<b} \mid \langle e_b, \uparrow e_b, \downarrow e_b\rangle \in [\![\underline{spk.to}]\!](v)\}$
$\& \; p_{<b} \subseteq \{v \mid \langle{}^{<}e_b, \uparrow({}^{<}e_b), \downarrow({}^{<}e_b)\rangle \in [\![\underline{spk.to}]\!](v)\}$
$\& \; w_{<b} \in p'_{<b} = \{v \in p_{<b} \mid \mathbf{o} \in [\![gone.out]\!](v)\}\}$

2 OPTATIVES WITH(OUT) REPORTATIVE RECENTERING

Figure 1. Attitudes and ideals (cf. Lewis 1981)

$A_w\, e \quad := \quad \lambda p(A_w(e, \uparrow e, p)) \qquad A \in \{\underline{des}, \underline{dir}, \ldots\} \subseteq Con_{\omega\varepsilon\delta\Omega t}$

$w <_Q v \quad := \quad \lambda p(p \in Q \wedge w \in p) \subset \lambda p(p \in Q \wedge v \in p)$

$\text{OPT}(p, Q) \quad := \quad \lambda w(w \in p \wedge \neg\exists v(v \in p \wedge w <_Q v))$

(5) *Ole pulaarli!*
*Ole pulaar-**li***
Ole $\text{visit}_\top$-*OPT*.3SG
Let Ole come and visit!

(5′) $\text{Ole}^\top\ldots$
$^\top[x|\ x =_i ole]\ ^\top; \ldots$
$\text{visit}_\top$-OPT-3SG
$\partial[\underline{spk.to}_{\top\Omega}\langle\top\varepsilon, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle]; [w|\ visit_w\langle\top\delta, \uparrow\top\varepsilon\rangle]; [p|\ p =_I \bot\omega||];$
$[\text{OPT}\langle\top\Omega, \underline{des}_{\top\omega}\top\varepsilon\rangle \subseteq_i \bot\Omega]; [\top\Omega =_I \top\omega||_{\top\Omega}]$

(5″) $\{\langle\langle \mathbf{o}, w_a, p_a, e_a\rangle, \langle q_a, v_a\rangle\rangle|\ \mathbf{o} = [\![ole]\!]$
$\&\ v_a \in q_a = \{v|\ \langle \mathbf{o}, \uparrow e_a\rangle \in [\![visit]\!](v)\}$
$\&\ w_a \in p_a \subseteq \{v|\ \langle e_a, \uparrow e_a, \downarrow e_a\rangle \in [\![\underline{spk.to}]\!](v)\ \&$
$\exists Q_v\!: Q_v = \{q|\ \langle e_a, \uparrow e_a, q\rangle \in [\![\underline{des}]\!](v)\}\ \&\ \text{OPT}(p_a, Q_v) \subseteq q_a\}\}$

(6) *Olegooq pulaarli*!
*Ole=**guuq** pulaar-**li***
Ole=*RPT* $\text{visit}_\top$-*OPT*.3SG
$\text{RPT}^>$. Say for me [$\uparrow e_a$], let Ole come and visit [me]! (see bk, Ch. 6)
$\text{RPT}^<$. I was to say [for $\uparrow^< e_r$], let Ole come and visit [$\uparrow^< e_r$]! ($e_a = {}^< e_r$)

($6'_<$) $\text{Ole}^\top\text{=RPT}^< \ldots$
$^\top[x|\ x =_i ole]; \partial[\underline{spk.to}_{\top\Omega}\langle\top\varepsilon, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle];\ ^\top[p|\ \underline{spk.to}_p\langle{}^<\top\varepsilon, \uparrow^<\top\varepsilon, \uparrow\top\varepsilon\rangle];$
$^\top[w|\ w \in_i \top\Omega]\ ^\top; \ldots$

$\text{visit}_\top$-OPT-3SG
$\partial[\underline{spk.to}_{\top\Omega}\langle{}^<\top\varepsilon, \uparrow^<\top\varepsilon, \downarrow^<\top\varepsilon\rangle]; [w|\ visit_w\langle\top\delta, \uparrow^<\top\varepsilon\rangle]; [p|\ p =_I \bot\omega||];$
$[\text{OPT}\langle\top\Omega, \underline{des}_{\top\omega}{}^<\top\varepsilon\rangle \subseteq_i \bot\Omega]; [\top\Omega =_I \top\omega||_{\top\Omega}]$

($6''_<$) $\{\langle\langle w_{<r}, p_{<r}, \mathbf{o}, w_r, p_r, e_r\rangle, \langle q_a, v_a\rangle\rangle|\ \mathbf{o} = [\![ole]\!]$
$\&\ w_r \in p_r \subseteq \{v|\ \langle e_r, \uparrow e_r, \downarrow e_r\rangle \in [\![\underline{spk.to}]\!](v)\}$
$\&\ v_a \in q_a = \{v|\ \langle \mathbf{o}, \uparrow^< e_r\rangle \in [\![visit]\!](v)\}$
$\&\ w_{<r} \in p_{<r} \subseteq \{v|\ \langle{}^< e_r, \uparrow({}^< e_r), \downarrow({}^< e_r)\rangle \in [\![\underline{spk.to}]\!](v)\ \&$
$\exists Q_v\!: Q_v = \{q|\ \langle{}^< e_r, \uparrow^< e_r, q\rangle \in [\![\underline{des}]\!](v)\}\ \&\ \text{OPT}(p_{<r}, Q_v) \subseteq q_a\}\}$

3 KALAALLISUT INFLECTIONS AS TOP-LEVEL ANAPHORA

(7) [Yesterday the school kids had a dog sled race.]

Ole-p *ikinngut-ni* *ajugaa-**mm-at*** *nuannaar-utigi-**pa-a**.*

Ole-ERG$^{\top}$ friend-3SG$_{\top}$.$^{\perp}$ win-*FCT*$_{\perp}$-*3SG*$_{\perp}$ happy-about-*DEC*$_{\top\perp}$-*3SG.3SG*

Ole$^{\top}$, whose$_{\top}$ friend$^{\perp}$ won,$^{\perp}$ was happy about it$_{\perp}$.

(7′) *Model*:

- e_a is a speech event in $\{w_1, w_2, w_3\} =: p_{123}$
- Ole (**o**) has friend **b** in $\{w_1, w_2\}$, friend **d** in $\{w_2\}$
- **b** wins in $\{w_1, w_2\} =: p_{12}$, **d** wins in $\{w_3\} =: p_3$
- Ole (**o**) is happy about inhabiting p_{12} in $\{w_2\} =: p_2$

Ole-ERG$^{\top}$ friend-*3SG*$_{\top}$.$^{\perp}$	[$_{\text{FCT}\perp}$ win-	]-FCT$_{\perp}$-3SG$_{\perp}$
$^{\top}[x \mid x =_i ole]$; $[x \mid frn_{\top\omega}\langle x, \top\delta\rangle]$;	$[w \mid win_w\langle \perp\delta\rangle]$;	$[\top\Omega \subseteq_I \perp\omega\|_{\perp\delta}]$;
c_2	c_3	c_4
$\langle\langle \mathbf{o}, w_1, p_{12}, e_a\rangle, \langle \mathbf{b}\rangle\rangle$	$\langle\langle \mathbf{o}, w_1, p_{12}, e_a\rangle, \langle w_1, \mathbf{b}\rangle\rangle$	$\langle\langle \mathbf{o}, w_1, p_{12}, e_a\rangle, \langle w_1, \mathbf{b}\rangle\rangle$
	$\langle\langle \mathbf{o}, w_1, p_{12}, e_a\rangle, \langle w_2, \mathbf{b}\rangle\rangle$	$\langle\langle \mathbf{o}, w_1, p_{12}, e_a\rangle, \langle w_2, \mathbf{b}\rangle\rangle$
$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle \mathbf{b}\rangle\rangle$	$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_1, \mathbf{b}\rangle\rangle$	$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_1, \mathbf{b}\rangle\rangle$
	$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_2, \mathbf{b}\rangle\rangle$	$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_2, \mathbf{b}\rangle\rangle$
$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle \mathbf{d}\rangle\rangle$	$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_3, \mathbf{d}\rangle\rangle$	
⋮(other $\top\Omega$-values)	⋮(other $\top\Omega$-values)	⋮(other $\top\Omega$-values)

[$_{\text{DEC}}$	happy-	]-DEC$_{\top\perp}$-3SG.3SG
$\partial[\underline{spk.to}_{\top\Omega}\langle \top\varepsilon, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle]$;	$[happy.abt_{\top\omega}\{\top\delta, \perp\omega\|_{\perp\delta}\}]$;	$^{\top}[p \mid p =_I \top\omega\|_{\top\Omega}]$
✓c_4	c_5	c_6
	$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_1, \mathbf{b}\rangle\rangle$	$\langle\langle p_2, \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_1, \mathbf{b}\rangle\rangle$
	$\langle\langle \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_2, \mathbf{b}\rangle\rangle$	$\langle\langle p_2, \mathbf{o}, w_2, p_{12}, e_a\rangle, \langle w_2, \mathbf{b}\rangle\rangle$
	⋮(other $\top\Omega$-values)	⋮(other $\top\Omega$-values)

(7″) $\{\langle\langle p'_a, \mathbf{o}, w_a, p_a, e_a\rangle, \langle w_x, x\rangle\rangle \mid \mathbf{o} = [\![ole]\!]$ &

$\exists q_x$: $w_x \in q_x = \{v \mid x \in [\![win]\!](v)\}$

& $p_a \subseteq \{v \in q_x \mid \langle e_a, \uparrow e_a, \downarrow e_a\rangle \in [\![\underline{spk.to}]\!](v)$ & $\langle x, \mathbf{o}\rangle \in [\![friend]\!](v)\}$

& $w_a \in p'_a = \{v \in p_a \mid \langle \mathbf{o}, q_x\rangle \in [\![happy.abt]\!](v)\}\}$

(8) ***Naamik*** *nuannaar-utigi-nngit-**la-a***

no happy-about-not-*DEC*-*3SG.3SG*

No, he$_{\top}$ was not happy about it$_{\perp}$.

(8′) START-UP (no) …

$^{\top}[e \mid \uparrow e =_i \downarrow\top\varepsilon, \downarrow e =_i \uparrow\top\varepsilon]$; $^{\top}[p \mid \underline{spk.to}_p\langle \top\varepsilon, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle]$; $[\top\Omega \subseteq_I \perp\omega\|_{\perp\delta}]$;

$^{\top}[w \mid w \in_i \top\Omega]$; …

[$_{\text{DEC}}$	happy-not-	]-DEC$_{\top\perp}$-3SG.3SG
$\partial[\underline{spk.to}_{\top\Omega}\langle \top\varepsilon, \uparrow\top\varepsilon, \downarrow\top\varepsilon\rangle]$;	$\sim[happy.abt_{\top\omega}\{\top\delta, \perp\omega\|_{\perp\delta}\}]$;	$^{\top}[p \mid p =_I \top\omega\|_{\top\Omega}]$

(8″) $\{\langle\langle p'_b, w_b, p_b, e_b, p'_a, \mathbf{o}, w_a, p_a, e_a\rangle, \langle w_x, x\rangle\rangle \mid$
$\langle\langle p'_a, \mathbf{o}, w_a, p_a, e_a\rangle, \langle w_x, x\rangle\rangle \in (6)\ \&\ {\uparrow}e_b = {\downarrow}e_a\ \&\ {\downarrow}e_b = {\uparrow}e_a\ \&$
$\exists q_x\colon q_x = \{v \mid x \in [\![\mathit{win}]\!](v)\}\ \&\ p_b \subseteq \{v \in q_x \mid \langle e_b, {\uparrow}e_b, {\downarrow}e_b\rangle \in [\![\underline{\mathit{spk.to}}]\!](v)\}$
$\&\ w_b \in p'_b = \{v \in p_b \mid \langle \mathbf{o}, q_x\rangle \notin [\![\mathit{happy.abt}]\!](v)\}\}$

(9) ***Aap, pilluaqqu-pa-a***
yes congratulate-*DEC*$_{\top\bot}$-*3SG.3SG*
Yes, he$_\top$ congratulated him$_\bot$.

(9′) START-UP (yes) …
$^\top[e \mid {\uparrow}e =_i {\downarrow}\top\varepsilon, {\downarrow}e =_i {\uparrow}\top\varepsilon];\ [\underline{\mathit{spk.to}}_{\top\Omega}\langle\top\varepsilon, {\uparrow}\top\varepsilon, {\downarrow}\top\varepsilon\rangle];\ [\top\omega \in_i \top\Omega];\ \ldots$
[$_{\text{DEC}}$ congratulate-]-DEC$_{\top\bot}$-3SG.3SG
$\partial[\underline{\mathit{spk.to}}_{\top\Omega}\langle\top\varepsilon, {\uparrow}\top\varepsilon, {\downarrow}\top\varepsilon\rangle];\ [\mathit{congratulate}_{\top\omega}\langle\top\delta, \bot\delta\rangle];\ ^\top[p \mid p =_I \top\omega\|_{\top\Omega}]$

(9″) $\{\langle\langle p'_b, e_b, p'_a, \mathbf{o}, w_a, p_a, e_a\rangle, \langle w_x, x\rangle\rangle \mid$
$\langle\langle p'_a, \mathbf{o}, w_a, p_a, e_a\rangle, \langle w_x, x\rangle\rangle \in (6)\ \&\ {\uparrow}e_b = {\downarrow}e_a\ \&\ {\downarrow}e_b = {\uparrow}e_a$
$\&\ p'_a \subseteq \{v \mid \langle e_b, {\uparrow}e_b, {\downarrow}e_b\rangle \in [\![\underline{\mathit{spk.to}}]\!](v)\}$
$\&\ w_a \in p'_b = \{v \in p'_a \mid \langle \mathbf{o}, x\rangle \in [\![\mathit{congratulate}]\!](v)\}\}$

Figure 1 Centering TAMP-universals

(*T*) TNS fills, or pushes down, the verb's time argument with a dref anchored to a top-ranked time and/or event ($\top\tau$, $\bot\tau$, $\top\varepsilon$, $\bot\varepsilon$).
(*A*) ASP fills, or pushes down, the verb's eventuality argument with a dref anchored to a top-ranked state and/or event ($\top\sigma$, $\bot\sigma$, $\top\varepsilon$, $\bot\varepsilon$).
(*M*) MOOD fills, or pushes down, the verb's world argument with a dref anchored to a top-ranked world and/or event ($\top\omega$, $\bot\omega$, $\top\varepsilon$, $\bot\varepsilon$).
(*P*) PRN fills the verb's subject or object argument with a dref anchored to a top-ranked individual and/or event ($\top\delta$, $\bot\delta$, $\top\varepsilon$, $\bot\varepsilon$).

4 WHY ONLY DECLARATIVES HAVE TRUTH CONDITIONS

BASIC IDEAS:

- All sentences (any MOOD, with or without RPT) express *updates*
  (a la Lewis 1972, Hamblin 1973, Bittner 2009, 2011, Murray 2010, …)

- Only *declaratives* (DEC) express ***at-issue*** updates (D6, cf. AnderBois *et al.* '10)
  In reportative declaratives (RPT…DEC), *topic-setting* RPT-update is *not* at-issue,
  $\top\omega$-*comment* in its scope is *at-issue* (cf. Murray 2010)
  Illocutionary/context-setting MOOD-updates (DEC, OPT, FCT, …) are *not* at-issue

- Only *at-issue updates* are negotiable, e.g. raise the issue of ***truth value*** (see D7)

APPENDIX A: $UC_{\delta+}$ WITH ILLOCUTIONARY CENTERING ($UC_{\omega+}$, Bittner 2012: Ch. 6)

D1 The set of $UC_{\omega+}$ *types* is the smallest set Θ s.t.: (i) $t, \delta, \varepsilon, \omega, s \in \Theta$, (ii) $(ab) \in \Theta$ if $a, b \in \Theta$. The subset $\text{DR}(\Theta) = \{\delta, \varepsilon, \omega, \delta t, \varepsilon t, \omega t\}$ is the set of *dref types*.

D2 A $UC_{\omega+}$ *frame* is a set $\mathcal{F} = \{\mathcal{D}_a | a \in \Theta\}$ such that:

i. $\mathcal{D}_t = \{0, 1\}$, $\mathcal{D}_\delta$, $\mathcal{D}_\varepsilon$, and $\mathcal{D}_\omega$ are non-empty pairwise disjoint sets

ii. $\mathcal{D}_s = \cup_{n \geq 0,\, m \geq 0}\{\langle\langle d_1, \ldots, d_n\rangle, \langle d'_1, \ldots, d'_m\rangle\rangle: d_i, d'_j \in \mathcal{D}_{dr}\}$, where $\mathcal{D}_{dr} = \cup\{\mathcal{D}_a: a \in \text{DR}(\Theta)\}$

iii. $\mathcal{D}_{ab} = \{f | \varnothing \subset \text{Dom } f \subseteq \mathcal{D}_a \ \& \ \text{Ran } f \subseteq \mathcal{D}_b\}$

D3 A $UC_{\omega+}$ *model* is a tuple $\mathcal{M} = \langle \mathcal{F}, \uparrow, \downarrow, {}^{<}, {}^{>}, [\![\cdot]\!]\rangle$ where $\mathcal{F}$ is a $UC_{\omega+}$ frame and $[\![\cdot]\!]$ is an interpretation function that maps $A \in Con_a$ to $[\![A]\!] \in \mathcal{D}_a$. Moreover:

i. $x = \uparrow e \ \Rightarrow \ e \in \mathcal{D}_\varepsilon \ \& \ x \in \mathcal{D}_\delta$ (*central individual*)

$y = \downarrow e \ \Rightarrow \ e \in \mathcal{D}_\varepsilon \ \& \ y \in \mathcal{D}_\delta \ \& \ \exists x: x = \uparrow u$ (*background individual*)

ii. $e' = {}^{<}e \ \Rightarrow \ e, e' \in \mathcal{D}_\varepsilon \ \& \ \uparrow e' \neq \uparrow e$ (*source*)

$e' = {}^{>}e \ \Rightarrow \ e \in \mathcal{D}_\varepsilon, e' \in \mathcal{D}_{\omega\varepsilon} \ \& \ \forall w \in \text{Dom } e': \uparrow(e'_w) = \downarrow e$ (*directive*)

iii. $\forall w \in \mathcal{D}_\omega, e \in \mathcal{D}_\varepsilon, d, d' \in \mathcal{D}_\delta$:

$\langle e, d, \ldots\rangle \in [\![A]\!](w) \Leftrightarrow \langle e, \uparrow e, \ldots\rangle \in [\![A]\!](w) \ \& \ \uparrow e = d$

$\langle e, d, d'\ldots\rangle \in [\![A]\!](w) \Leftrightarrow \langle e, d, \downarrow e \ldots\rangle \in [\![A]\!](w) \ \& \ \downarrow e = d'$

iv. $\forall a \in \text{DR}(\Theta), i \in \mathcal{D}_s$:

$[\![\top a]\!](i) \doteq ((①i)_a)_1$ $\quad [\![\top' a]\!](i) \doteq ((①i)_a)_2$ $\quad [\![\top^{\Rightarrow} a]\!](i) \doteq {}^{\chi}\{((①i)_a)_n: n \geq 1\}$

$[\![\perp a]\!](i) \doteq ((②i)_a)_1$ $\quad [\![\perp' a]\!](i) \doteq ((②i)_a)_2$ $\quad [\![\perp^{\Rightarrow} a]\!](i) \doteq {}^{\chi}\{((②i)_a)_n: n \geq 1\}$

D4 ($UC_{\omega+}$ syntax) For any type $a \in \Theta$, define the set of *a-terms*, $Term_a$:

i. $Con_a \cup Var_a \subseteq Term_a$

ii. $(A_a = B_a) \in Term_t$, if $A_a, B_a \in Term_a$

$(A_s \precsim B_s) \in Term_t$, if $A_s, B_s \in Term_s$

iii. $\neg\varphi, (\varphi \wedge \psi) \in Term_t$, if $\varphi, \psi \in Term_t$

iv. $\exists u_a \varphi \in Term_t$, if $u_a \in Var_a$ and $\varphi \in Term_t$

v. $\lambda u_a(B) \in Term_{ab}$, if $u_a \in Var_a$ and $B \in Term_b$

vi. $BA \in Term_b$, if $B \in Term_{ab}$ and $A \in Term_a$

vii. $\uparrow A, \downarrow A \in Term_\delta$, if $A \in Term_\varepsilon$

${}^{<}A \in Term_\varepsilon \ \& \ {}^{>}A \in Term_{\omega\varepsilon}$, if $A \in Term_\varepsilon$

viii. $(A_a {}^{\top}\!\bullet B), (A_a {}^{\perp}\!\bullet B) \in Term_s$, if $a \in \text{DR}(\Theta)$, $A_a \in Trm_a$ and $B \in Term_s$

ix. $(A {}^{\top}; B), (A {}^{\perp}; B) \in Term_{(st)st}$, if $A, B \in Trm_{(st)st}$

D5 ($UC_{\omega+}$ semantics) For any $\mathcal{M} = \langle \mathcal{F}, \uparrow, \downarrow, ^{<}, ^{>}, [\![\cdot]\!] \rangle$ and $\mathcal{M}$-assignment g:

i.	$[\![A]\!]^g$	$= [\![A]\!]$	, if $A \in Con_a$
	$[\![A]\!]^g$	$= g(A)$	, if $A \in Var_a$
ii.	$[\![(A_a = B_a)]\!]^g$	$= 1$	, if $[\![A_a]\!]^g = [\![B_a]\!]^g$; else, 0
	$[\![(A_s \precsim B_s)]\!]^g$	$= 1$	, if $[\![A_s]\!]^g \precsim_s [\![B_s]\!]^g$; else, 0
iii.	$[\![\neg\varphi]\!]^g$	$= 1$	, if $[\![\varphi]\!]^g = 0$; else, 0
	$[\![(\varphi \wedge \psi)]\!]^g$	$= 1$	, if $[\![\varphi]\!]^g = 1$ and $[\![\psi]\!]^g = 1$; else, 0
iv.	$[\![\exists u_a \varphi]\!]^g$	$= 1$	, if $\{\mathsf{d} \in \mathcal{D}_a \mid [\![\varphi]\!]^{g[u/\mathsf{d}]} = 1\} \neq \varnothing$; else, 0
v.	$[\![\lambda u_a(B)]\!]^g(\mathsf{d})$	$\doteq [\![B]\!]^{g[u/\mathsf{d}]}$	, if $\mathsf{d} \in \mathcal{D}_a$
vi.	$[\![BA]\!]^g$	$\doteq [\![B]\!]^g([\![A]\!]^g)$	
vii.	$[\![fA]\!]^g$	$\doteq f([\![A]\!]^g)$	, if $f \in \{\uparrow, \downarrow, ^{<}, ^{>}\}$
viii.	$[\![(A\ {}^{\top}\!\bullet B)]\!]^g$	$\doteq \langle ([\![A]\!]^g \cdot ①[\![B]\!]^g), ②[\![B]\!]^g \rangle$	
	$[\![(A\ {}^{\perp}\!\bullet B)]\!]^g$	$\doteq \langle ①[\![B]\!]^g, ([\![A]\!]^g \cdot ②[\![B]\!]^g) \rangle$	

ix. $\mathsf{c}[\![(A\ {}^{\top}; B)]\!]^g = \{\mathsf{k} \in \mathsf{c}[\![A]\!]^g[\![B]\!]^g \mid \exists \mathsf{i} \in \mathsf{c} \exists \mathsf{j} \in \mathsf{c}[\![A]\!]^g \exists a \in \mathrm{DR}(\Theta)\text{: } (①\mathsf{j})_1 \in \mathcal{D}_a$
$\quad \& \ ①\mathsf{i} \prec ①\mathsf{j} \ \& \ (①\mathsf{j})_a = (①\mathsf{k})_a \ \& \ [\![B]\!]^g \neq [\![B[\top a/\perp a]]\!]^g\}$

$\mathsf{c}[\![(A\ {}^{\perp}; B)]\!]^g = \{\mathsf{k} \in \mathsf{c}[\![A]\!]^g[\![B]\!]^g \mid \exists \mathsf{i} \in \mathsf{c} \exists \mathsf{j} \in \mathsf{c}[\![A]\!]^g \exists a \in \mathrm{DR}(\Theta)\text{: } (②\mathsf{j})_1 \in \mathcal{D}_a$
$\quad \& \ ②\mathsf{i} \prec ②\mathsf{j} \ \& \ (②\mathsf{j})_a = (②\mathsf{k})_a \ \& \ [\![B]\!]^g \neq [\![B[\perp a/\top a]]\!]^g\}$

D6 For $(st)st$-term K, model $\mathcal{M}$, assignment g, info-state c, and $\mathsf{i} \in \mathsf{c}$:

i. $\mathcal{I}_{\mathcal{M}, g}(\mathsf{i}, \mathsf{c}) = [\![\lambda w(\exists k(Ik \wedge \top\Omega i = \top\Omega k \wedge w = \top\omega k))]\!]^{g[i/\mathsf{i}][I/\mathsf{c}]}$

ii. K is *at-issue* iff $\exists\mathcal{M}\exists\mathsf{c}\exists\mathsf{i} \in \mathsf{c}\exists\mathsf{j}\text{: } \mathsf{i} \precsim_s \mathsf{j} \ \& \forall g\text{: } \mathcal{I}_{\mathcal{M}, g}(\mathsf{j}, \mathsf{c}[\![K]\!]^g) \subset \mathcal{I}_{\mathcal{M}, g}(\mathsf{i}, \mathsf{c})$

D7 (truth, falsity) For $(st)st$-term K, model $\mathcal{M}$, info-state c, and world w:

i. $\mathcal{M}, \mathsf{c}, \mathsf{w} \models K$ iff K is at-issue & $\exists \mathsf{i} \in \mathsf{c} \forall g\text{: } \mathsf{w} \in \mathcal{I}_{\mathcal{M}, g}(\mathsf{i}, \mathsf{c}[\![K]\!]^g)$

ii. $\mathcal{M}, \mathsf{c}, \mathsf{w} \not\models K$ iff K is at-issue & $\neg\exists \mathsf{i} \in \mathsf{c} \forall g\text{: } \mathsf{w} \in \mathcal{I}_{\mathcal{M}, g}(\mathsf{i}, \mathsf{c}[\![K]\!]^g)$

D8 For any speech act $\mathsf{e} \in \mathcal{D}_\varepsilon$:

i. e is a *real speech act* iff $\exists \mathsf{w} \in \mathcal{D}_\omega\text{: } \langle \mathsf{e}, \uparrow\mathsf{e}, \downarrow\mathsf{e} \rangle \in [\![\underline{spk.to}]\!](\mathsf{w})$.

ii. ${}^{st}\mathsf{e} = {}^{\chi}\{\langle\langle \mathsf{w}, \mathsf{p}, \mathsf{e}\rangle, \langle\rangle\rangle \mid \mathsf{w} \in \mathsf{p} \subseteq \{\mathsf{v} \mid \langle \mathsf{e}, \uparrow\mathsf{e}, \downarrow\mathsf{e} \rangle \in [\![\underline{spk.to}]\!](\mathsf{v})\}\}$
is the e-*startup info-state.*

APPENDIX B: DRT-ABBREVIATIONS FOR $UC_{\omega+}$

Figure 5. Drt-abbreviations for $UC_{\omega+}$-terms

• static conditions (type t)

$A_{at} \subseteq B_{at} \quad := \quad \forall u_a(Au \rightarrow Bu)$

$B_w(A_1, ..., A_n) \quad := \quad BwA_1 \ldots A_n$

$B_p(A_1, ..., A_n) \quad := \quad p \subseteq \lambda w(BwA_1 \ldots A_n)$

• local condition (type st)

$B_W\langle A_1, ..., A_n\rangle \quad := \quad \lambda i(B_{W^\circ i}(A_1{}^\circ i, \ldots, A_n{}^\circ i))$

• global condition (type $s(st)t$)

$B_W\{A_1, ..., A_n\} \quad := \quad \lambda i \lambda I(B_{W*iI}(A_1{}^*iI, \ldots, A_n{}^*iI))$

• global update (type $(st)st$)

$\partial K \quad := \quad \lambda I \lambda j(Ij \leftrightarrow (KI = I))$

REFERENCES

AnderBois, S., A. Brasoveanu, and R. Henderson. 2010. Crossing the Appositive/At-Issue Meaning Boundary. *Proceedings from SALT XX.*

Bittner, M. 2005. Future discourse in a tenseless language. *Journal of Semantics* **22**:339–88.

Bittner, M. 2007. Online update: Temporal, modal, and *de se* anaphora in polysynthetic discourse. In: *Direct Compositionality* (C. Barker & P. Jacobson, eds.) OUP, 363–404.

Bittner, M. 2009. Tense, mood, and centering. Rutgers ms. *http://www.rci.rutgers.edu/~mbittner*

Bittner, M. 2011. Time and modality without tenses or modals. In: *Tense across Languages* (Rathert, M. & R. Musan, eds.) De Gruyter, Berlin, 147–88.

Farkas, D. 1992. On the semantics of subjunctive complements. In: *Romance Languages and Modern Linguistic Theory* (P. Hischbühler, ed.). J. Benjamins, 69–105.

Groenendijk, J. and M. Stokhof. 1984. *Studies on the Semantics of Questions and the Pragmatics of Answers.* Ph.D. dissertation, University of Amsterdam.

Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* **10**:41–53.

Karttunen, L. 1977. Syntax and semantics of questions. *Linguistics and Philosophy.*

Kratzer, A. 1981. The notional category of modality. In: *Words, Worlds, and Contexts* (H. J. Eikmeyer & H. Rieser). de Gruyter, 38–74.

Lewis, D. 1972. General semantics. In: *Semantics of Natural Language* (D. Davidson & G. Harman). Reidel, Dordrecht, 169–218.

Lewis, D. 1981. Ordering semantics and premise semantics for counterfactuals. *Journal of Philosophical Logic* **10**:217–34.

Mastop, R. J. 2005. *What Can You Do: Imperative Mood in Semantic Theory.* ILLC dissertation.

Murray, S. 2010. *Evidentiality and the Structure of Speech Acts.* Ph.D. dissertation, Rutgers.

Muskens, R. 1995. Tense and the logic of change. In: *Lexical Knowledge in the Organization of Language* (U. Egli *et al.*, eds.). J. Benjamins, Amsterdam. 147–84.

Portner, P. 2004. The semantics of imperatives within a theory of clause types. *SALT 14*, 235–52.

Roberts, C. 1987. *Modal Subordination, Anaphora, and Distributivity.* Ph.D. diss., UMass.

Stalnaker, R. 1975. Indicative conditionals. *Philosophia* **5**:269–86.

Stenius, E. 1967. Mood and language-game. *Synthese* **17**:254–274.

Stone, M. 1997. The anaphoric parallel between tenses and modals. *IRCS Report 97–06.*